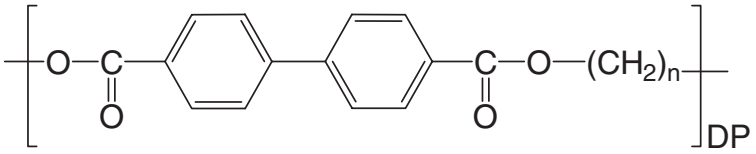
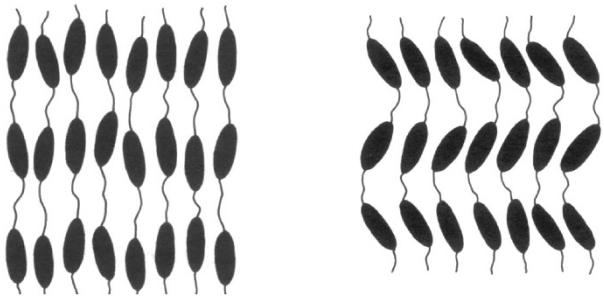
Several Interesting Fields Exploited through Understanding of Polymeric Effects on Liquid Crystals of Main-Chain Polyesters

M. TOKITA and J. WATANABE

[Award Accounts: SPSJ Mitsubishi Chemical Award (2005)]
Vol. 38, No. 7, pp 611–638 (2006)

We review our experimental results on the structural characteristics of polymeic liquid crystals which have been collected through our studies on the main-chain liquid crystalline polyesters with mesogenic biphenyl groups connected by flexible alkyl spacer.





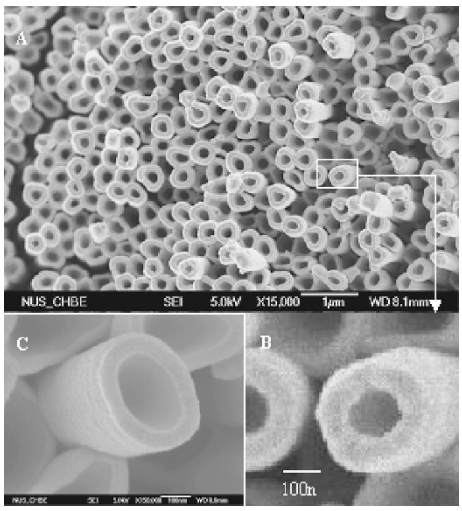
n :even number *n*: odd number

Non-Polar Polymer Nanotubes and Nanowires Fabricated by Wetting Anodic Aluminium Oxide Template

X. SHE, G. SONG, J. LI, P. HAN, S. YANG, W. SHULONG, and Z. PENG

[Regular Article]
Vol. 38, No. 7, pp 639–642 (2006)

Non-polar polymer nanotubes and nanowires were fabricated using nanoporous Anodic Aluminium Oxide (AAO) template via a physical wetting of the polymer solution and melt. Testing results of field emission scanning electron microscopy (FESEM) demonstrate that non-polar polymer nanotubes can be prepared by the methods. As for melt wetting method, there is a critical temperature for preparing nanotubes, and the structure of products depends on the viscosity and flowability of the polymer melt. The mechanism of melt wetting method is also discussed.

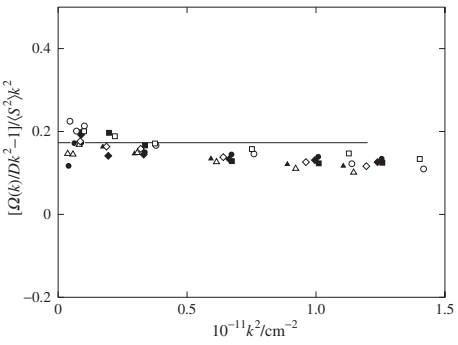


First Cumulant of the Dynamic Structure Factor for Flexible Polymers. Excluded-Volume Effects

M. OSA, N. SAWATARI, T. YOSHIZAKI, and H. YAMAKAWA

[Regular Article]
Vol. 38, No. 7, pp 643–650 (2006)

An experimental study was made of the excluded-volume effects on the first cumulant $\Omega(k)$ of the dynamic structure factor as a function of the magnitude k of the scattering vector. From plots of $[\Omega(k)/Dk^2 - 1]/\langle S^2\rangle k^2$ against k^2, where D is the translational diffusion coefficient and $\langle S^2\rangle$ the mean-square radius of gyration, for polystyrene (circle), poly(methyl methacrylate) (triangle), poly(α-methylstyrene) (square), and polyisobutylene (diamond) in good (unfilled) and Θ (filled) solvents, it is seen that the excluded-volume effect on this quantity is very small if any, as predicted by the Tanaka–Stockmayer first-order perturbation theory.

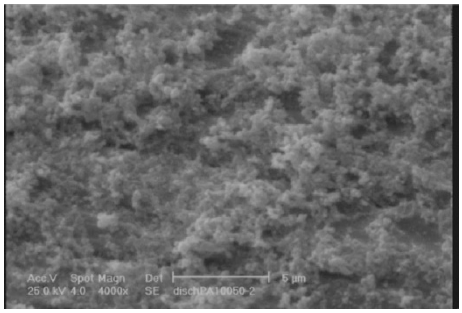


Polymerization of Aniline through Simultaneous Chemical and Electrochemical Routes

A. EFTEKHARI and P. JAFARKHANI

[Regular Article]
Vol. 38, No. 7, pp 651–658 (2006)

Simultaneous chemical and electrochemical polymerization of aniline was investigated to explore the competition between two polymerization routes. By performing the electropolymerization with slow scans, the initial chemical polymerization results in the formation of a nanostructured backbone. By this trick, it is possible to prepare highly porous and uniform nanostructured polyaniline film adherently attached to the substrate surface. In fact, chemically synthesized polyaniline nano-particles acts as growth sites for electrochemical polymerization, and in appropriate condition, numerous sites are formed instead of their continuous growth.

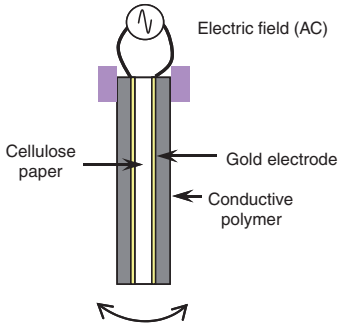


A Comparative Study of Conductive Polypyrrole and Polyaniline Coatings on Electro-Active Papers

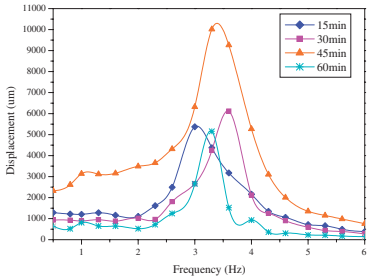
J. KIM, S. D. DESHPANDE, S. YUN, and Q. LI

[Regular Article]
Vol. 38, No. 7, pp 659–668 (2006)

Conductive Polymer coated Electro-active Paper [CP-EAPap] actuators are constructed using electro-deposition of polypyrrole and polyaniline on to cellulose paper. The actuation behavior is tested at different actuation frequency and humidity conditions on bilayer and trilayer types. The effect of thickness variation, dopant ions and humidity conditions are compared for both conductive polymer-coated paper actuators. The trilayer actuators are superior than the bilayer counterparts, and polyaniline coated actuators gives better performance than polypyrrole based ones. The possible actuation principle is also addressed.



Configuration of conductive polymer-coated trilayer EAPap actuator.



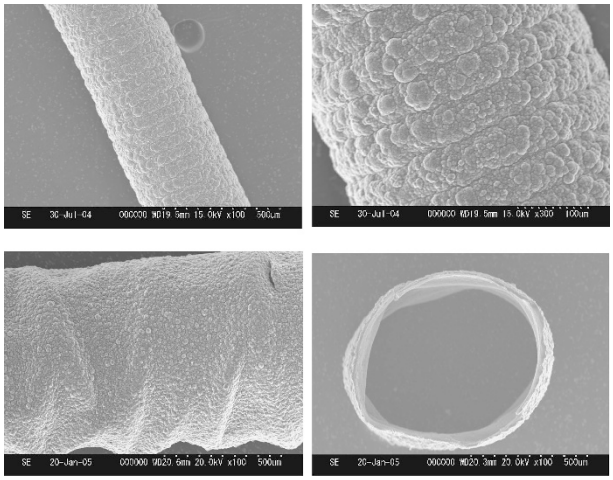
PANI-coated EAPap trilayer actuator with different deposition time.

Fast and Large Stretching Bis(trifluoromethylsulfonyl)imide (TFSI)-doped Polypyrrole Actuators and Their Applications to Small Devices

T. ZAMA, N. TANAKA, W. TAKASHIMA, and K. KANETO

[Regular Article]
Vol. 38, No. 7, pp 669–677 (2006)

SEM photographs of a TFSI-doped PPy-Au coil composite actuator (top) and a TFSI-doped PPy tube as the counter electrode.

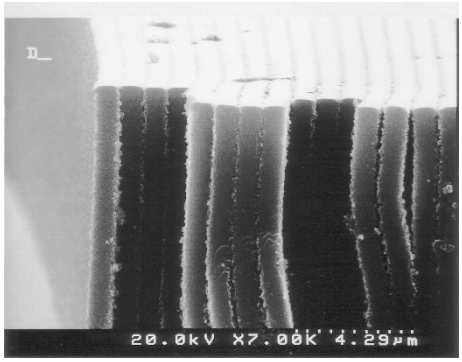


Transmission Holographic Gratings Using Siloxane-containing Liquid Crystalline Compounds. Importance of Chemical Structure of Polymer Matrix Components

M. HE, Y. H. CHO, and Y. KAWAKAMI

[Regular Article]
Vol. 38, No. 7, pp 678–685 (2006)

Fine gratings with 70% and 78% diffraction efficiency and angular selectivity of about 5° were formed with 10 wt % 4-cyano-4′-{(5-heptamethyltrisiloxan-1-yl)-pentyloxy} biphenyl and 4-cyanophenyl 4-{(5-heptamethyltrisiloxan-1-yl)pentyloxy}benzoate using pentaerythrytol pentaacrylate-neopentylglycol diglycidyl ether-tripropylene glycol diacrylate (4:5:1) as the polymer matrix component.

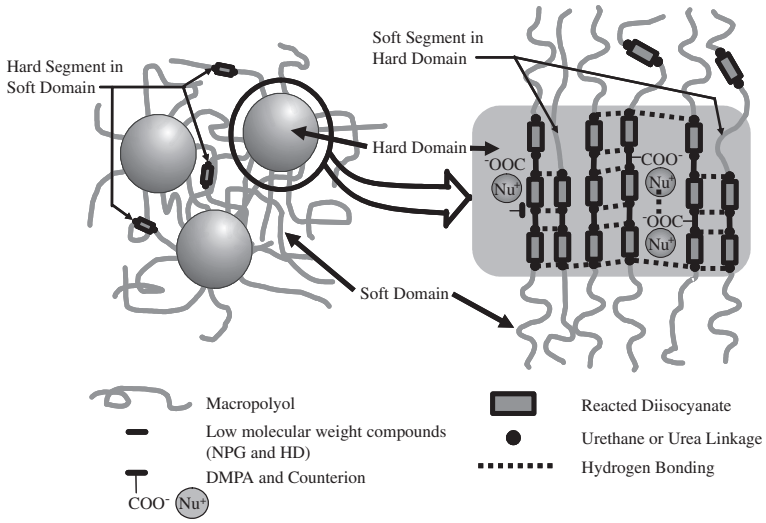


The Role of Hard Segments of Aqueous Polyurethane-urea Dispersion in Determining the Colloidal Characteristics and Physical Properties

T. TAWA and S. ITO

[Regular Article]
Vol. 38, No. 7, pp 686–693 (2006)

The colloidal and physical properties were investigated using a series of synthesized aqueous polyurethane-urea dispersions (PUDs). The physical properties were characterized by microphase separation of hard and soft domains, but microphase separation was not strict at the molecular chain level. The presence of the soft segment in the hard domain lowered the glass transition temperature of the hard domain, consequently affecting the mechanical strength.

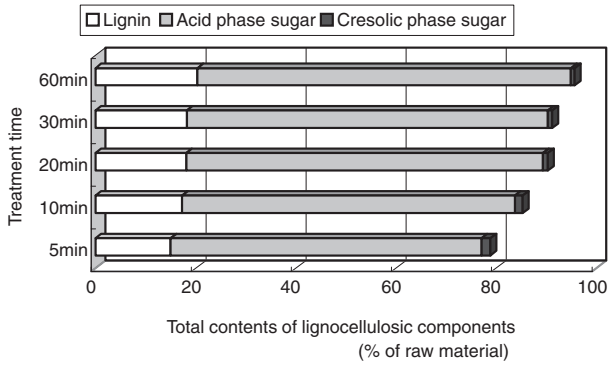


Conversion and Separation Pattern of Lignocellulosic Carbohydrates through the Phase-separation System

K. MIKAME and M. FUNAOKA

[Regular Article]
Vol. 38, No. 7, pp 694–702 (2006)

Through the phase-separation reaction system with sulfuric acid and phenols, lignocellulosics which form an interpenetrating polymer network within the cell wall were separated almost quantitatively into different phases within 20 min. The yield of carbohydrate of acid layer after the 60 min phase-separation treatment was 71% of raw material. A total yield of original lignin without grafting cresol in lignocresol, acid phase sugar and cresol phase sugar were 96% of raw material.



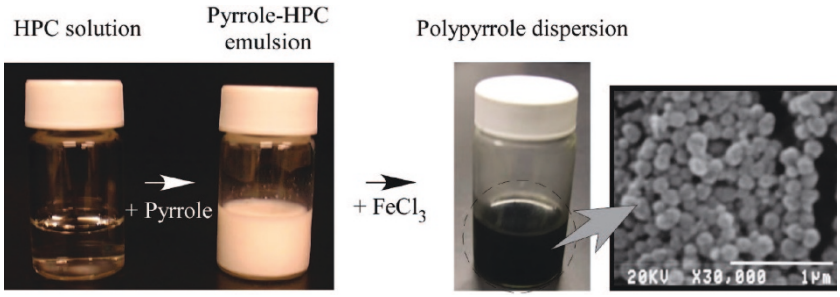
Total material balance of lignocellulosic components in 1step phase-separation treatment

Preparation of Polypyrrole by Emulsion Polymerization Using Hydroxypropyl Cellulose

M. AMAIKE and H. YAMAMOTO

[Regular Article]
Vol. 38, No. 7, pp 703–709 (2006)

Polypyrrole with particles of uniform diameter was easily obtained from an emulsion of hydroxypropyl cellulose (HPC) and pyrrole by chemical oxidative polymerization, using iron chloride as an oxidizing agent. The particle diameter of the polypyrrole could be controlled by changing the HPC concentration, and it was found that the preparation of water-dispersible polypyrrole was possible. The conductivity of the polypyrrole particles was of the order of 10^{-1} S/cm.

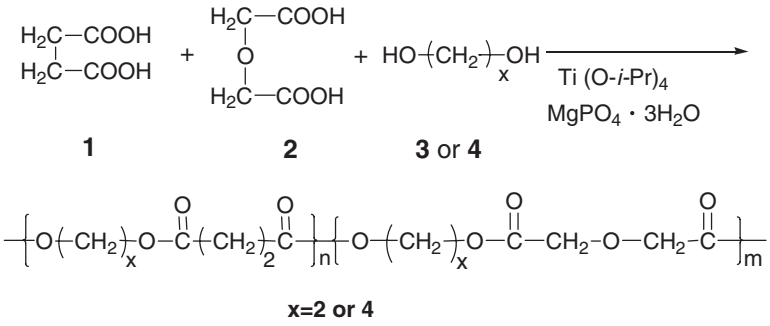


Synthesis of Poly(butylene succinate) and Poly(ethylene succinate) Including Diglycollate Moiety

A. OISHI, M. ZHANG, K. NAKAYAMA, T. MASUDA, and Y. TAGUCHI

[Regular Article]
Vol. 38, No. 7, pp 710–715 (2006)

Poly(butylene succinate) (PBS) copolymers were prepared from succinic acid, diglycollic acid, and 1,4-butanediol, in the presence of titanium tetraisopropoxide and magnesium hydrogen phosphate trihydrate. All the polymers produced exhibited a higher number-average molecular weight than 65,000. The copolymers exhibited a higher break strain compared to the homopolymer. Poly(ethylene succinate) (PES) copolymers, including diglycollate moiety, were also prepared from succinic acid, diglycollic acid, and ethylene glycol, using the same reaction conditions as the PBS copolymers.

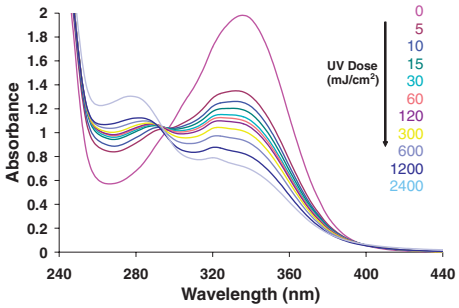


Synthesis and Characterization of Main Chain Polyimides Containing Chalcone Derivatives for LC Alignment

H. TUNELL, M. SELO, K. SKARP, and J. HILBORN

[Regular Article]
Vol. 38, No. 7, pp 716–723 (2006)

Two soluble polyimides containing chalcone derivatives in the main chains were successfully prepared using the Mitsunobu reaction at room temperature whereby the high temperature imidization step normally needed for the synthesis of polyimides is avoided and the polymers can be used for temperature sensitive applications. With UV-vis and FT-IR spectroscopic investigations it was concluded that photodimerization is occurring at low UV exposure doses and that *trans-cis* isomerization is starting simultaneously at higher doses. Optical anisotropy in the films were achieved upon exposure to LPUV light.

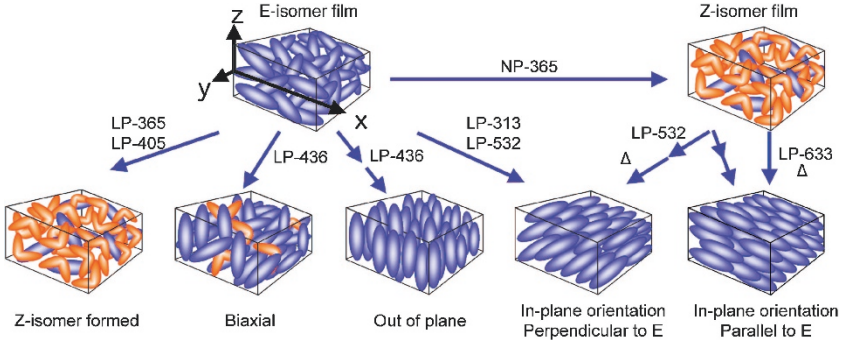


Influence of Wavelength of Light on Photoinduced Orientation of Azobenzene-Containing Polymethacrylate Film

E. UCHIDA and N. KAWATSUKI

[Regular Article]
Vol. 38, No. 7, pp 724–731 (2006)

Influence of the wavelength of linearly polarized (LP) light on the generation of photoinduced optical anisotropy of *E*- and *Z*-isomers of a polymethacrylate which comprises 4-methoxyazobenzene side groups was investigated using LP 313 nm, 365 nm, 405 nm, 436 nm, 532 nm, and 633 nm lights. Defferent orientation behavior was observed depending on the irradiating light's wavelength.

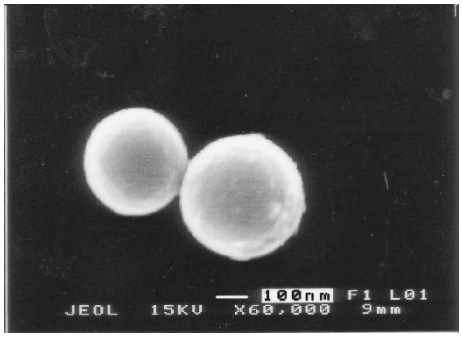


Template-free Formation of Microspheres Based on Poly(*N*-methylaniline)

K. SANADA, R. PATIL, Y. OOYAMA, J. YANO, and Y. HARIMA

[Short Communication]
Vol. 38, No. 7, pp 732–736 (2006)

Microspheres of conducting poly(*N*-methylaniline) were successfully synthesized through chemical polymerization using only monomer, acid and oxidant without any templates. The average diameter of the microspheres with a smooth surface was 0.38 μm when 0.025 M *N*-methylaniline was oxidized with 0.025 M ammonium persulfate in 0.025 M adipic acid solution. The size of microspheres varied from 0.16 to 0.54 μm by changing reaction time and temperature. It was found further that the acid concentration is critical for the formation of microspheres with smooth surfaces.



Biosynthesis of Terpolythioesters with 3-Mercaptopropionate Unit

H. KIMURA, K. MOURI, and Y. KAMEI

[Short Communication]
Vol. 38, No. 7, pp 737–741 (2006)

The novel sulfur containing terpolythioesters with 3-hydroxybutyrate (3HB), 3-mercaptopropionate (3MP) and 3-hydroxyvalerate (3HV) units and with 3HB, 3MP and 4-hydroxybutyrate (4HB) units were biosynthesized by a wild-type *Ralstonia eutropha* H16 from the mixed carbon sources consisting of thiodipropionic acid (TDP) and 3HV- or 4HB-supplying substrates. When TDP plus 3HV- or 4HB-supplying lactones were fed in the aqueous culture of *R. eutropha*, we found that the terpolythioesters with high 3MP fractions were produced, especially the 3MP fractions in terpolythioesters dramatically increased to as high as 71 mol % in case of feeding TDP and γ-butyrolactone.